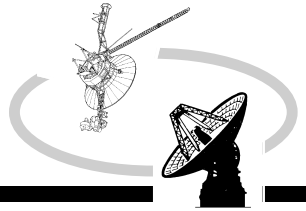
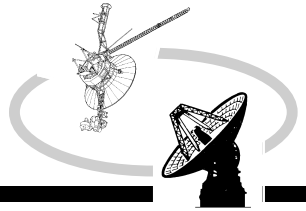
W-band Assessment
Agenda



- **W-band receiver**
  - **Status (Seiffert)**
  - **Downconverter design (Teitelbaum, Bagri)**
  - **Noise temperature calibration strategy (all)**
- **Blind pointing model development (Richter)**
- **Task plan review (all)**
- **Initial observing campaign (all)**
- **TMO Progress Report status (all)**

W-band Assessment
Downconverter Design

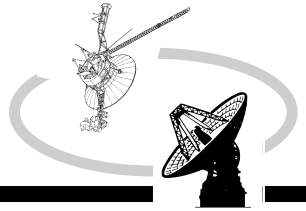


- **Accelerate development of phase-stable 75 GHz first stage downconverter by leveraging existing design that has succeeded in VLBI fringe test**
  - **Fringes were detected at Ka-band between DSS-13 and DSS-25 using RTB2**
  - **DSS-25 utilizes a 31.7 GHz downconverter that "translates the 31.8 - 32.3 GHz frequency band to the 100-600 MHz band with one fixed local oscillator at 31.7 GHz. The L.O. is a synthesizer with output frequency of 7.925 GHz, phase-locked to an external 100 MHz reference. The synthesizer output is followed by two x2 multipliers to provide the 31.7 GHz L.O."**
  - **DSS-25 specifications obtained from Chau Buu to start the design:**

"The Ka-band Downconverter at DSS 25 has met the following specifications:

	Specified	Measured
Residual Phase Noise	**-63 dBc/Hz at 1 Hz offset**	**-70 dBc/Hz at 1 Hz offset**
	-73 dBc/Hz at 10 Hz	**-78 dBc/Hz at 10 Hz**
	-83 dBc/Hz at 100 Hz	**-86 dBc/Hz at 100 Hz**
	-90 dBc/Hz at 1 kHz	**-92 dBc/Hz at 1 kHz**
Allan Deviation	**1.0e-13 at 1 s**	**2.0e-14 at 1 s**
	4.7e-15 at 10 s	**2.0e-15 at 10 s**
	5.6e-16 at 1000 s	**7.0e-17 at 1000 s**
	5.5e-16 at 3600 s	**7.0e-17 at 1000 s"**

W-band Assessment
Downconverter Design (Cont'd)

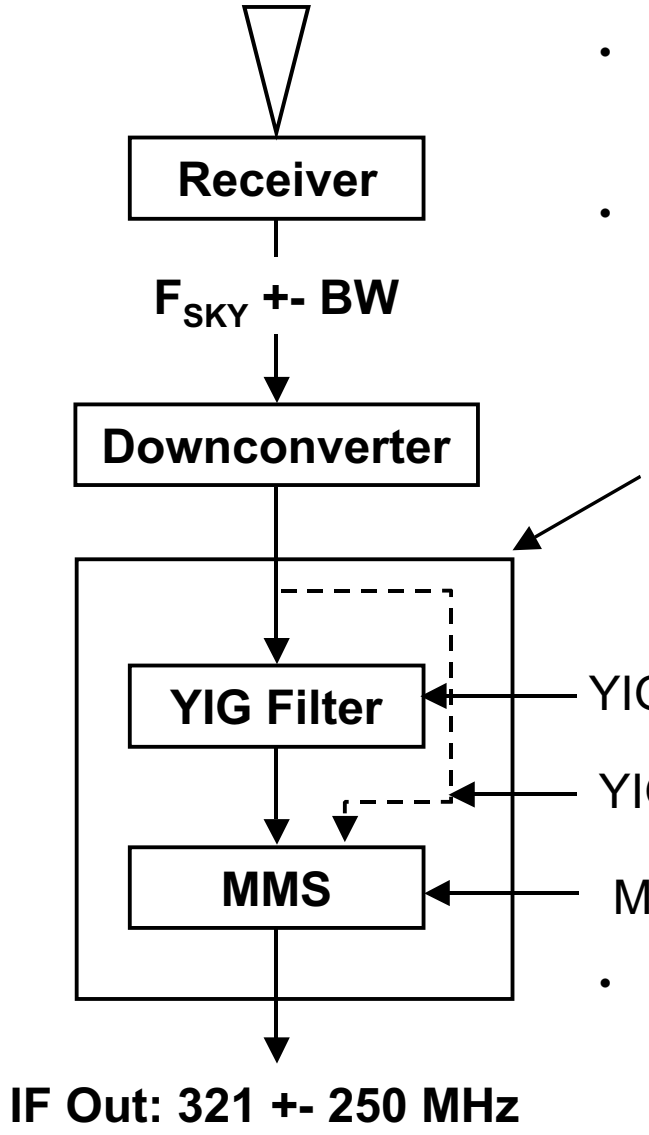


- **Based on considerations of integrated noise power and concerns about inadequate fall-off of the Ka-band design at high offset frequencies, we extended the phase noise specification for the 75 GHz W-band DC as follows:**

Residual Phase Noise	**-63 dBc/Hz at 1 Hz offset**
	-73 dBc/Hz at 10 Hz
	-83 dBc/Hz at 100 Hz
	-90 dBc/Hz at 1 kHz
	-100 dBc/Hz at 10 kHz
	-110 dBc/Hz at 100 kHz
	-120 dBc/Hz at 1 MHz offset and beyond

- **Technical requirements have been communicated to Conrad Foster and MTC to cost the job**
  - **If affordable, consider building two**
- **Alternative approach is to generate 18.75 GHz with DSS-13 resident Wiltron synthesizer, locked to station 100 MHz, then x4 multiply**
  - **Planning to bring Wiltron to JPL for phase noise measurement at Section335 FTS lab**

W-band Assessment
Downconverter Design (Cont'd)



- F_{SKY} +- BW = 90 +- 6 GHz
  - VLBI at 86 GHz with 500 MHz instantaneous bandwidth
  - 3 mm spectroscopy, tunable over 12 GHz
- Downconverter frequency = 75 GHz
  - VLBI and 3mm within tuning range of YIG filter, MMS
  - Can existing Ka-band design be applied with 18.75 GHz synthesizer in place of 7.925 GHz, with similar phase noise characteristics? Good enough?

Existing Equipment

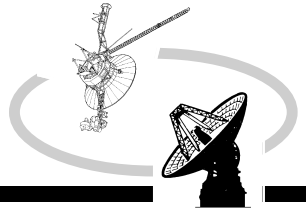
YIG Tuning Range: 8 - 26.5 GHz

YIG can be bypassed

MMS Tuning Range: 1 - 26.5 GHz

- Downconverter technical issues raised
  - ~18 GHz synthesizer falls in heart of tuning range of second LO stage (MMS,YIG)
  - Is YIG filter phase stability a problem for VLBI

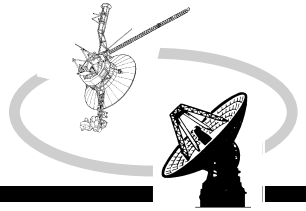
W-band Assessment
Strawman Task Plan



- **Complete the phase stabilization of the W-band receiver (Q2)**
- **Complete the development of computer-controlled noise temperature calibration instrumentation (Q2)**
- **Develop blind-pointing capability for W-band (Q3)**
- **Measure the antenna aperture efficiency (Q3)**

- **Obtain first fringes (Q3)**
- **Apply raster scan technique at W-band (Q3)**
- **Obtain data for antenna servo system study (Q3)**
- **Complete W-band link margin study (Q3)**
- **Explore implementation options to improve efficiency (Q4)**
- **Develop detectable point source catalog (Q4)**

W-band Assessment
Initial Observing Campaign



- **Cultivate an observing team**
  - **Seiffert, Bagri, Teitelbaum, Jones, Kuiper, …**
- **Initial DSS-13 commitment - one prime shift pass per week**
  - **After Mike S "blesses" the receiver**
  - **Usage to be coordinated by observing team**
- **Additional observing time can be requested by anyone**
  - **Requestor is responsible for observation**